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IS 13409 (1992): high frequency transreceivers [LITD 12: Transmitting Equipment for Radio Communication]

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उच्च आवृत्ति के ट्रांसरिसीवर – विशिष्टि

Indian Standard

HIGH FREQUENCY TRANSRECEIVERS — SPECIFICATION

UDC 621·396·61·029·6

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Standards Information Centre, Mysore

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 2

Radio Communications Sectional Committee, LTD 20

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Radio Communications Sectional Committee had been approved by Electronics and Telecommunication Division Council.

The object of this standard is to lay down the performance requirements for long range high frequency transreceivers in the frequency range 230 MHz.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

HIGH FREQUENCY TRANSRECEIVERS — SPECIFICATION

1 SCOPE

This standard applies to HF transreceivers in the frequency range 2-30 MHz using single side band amplitude modulation for telecommunication link up to 600 kMs.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
8186 : 1976	Marking codes for values and tolerances of resistors and capacitors
9000	Basic environmental testing procedures for electronic and electrical items:
(Part 2/Sec 4) : 1977	Part 2 Cold test, Section 4 Cold test for heat dissipating items with gradual change of temperature
(Part 3/Sec 5) : 1977	Part 3 Dry heat test, Section 5 Dry heat test for heat dissipating items with gradual change of temperature
(Part 4) 1979 :	Part 4 Damp heat (steady state)
(Part 7/Sec 1) : 1979	Part 7 Impact test, Section 1 Shock
(Part 7/Sec 2) : 1979	Part 7 Impact test, Section 2 Bump
(Part 7/Sec 4) : 1979	Part 7 Impact test, Section 4 Free fall
(Part 8) : 1981	Part 8 Vibration (sinusoidal) test
(Part 11) : 1983	Part 11 Salt mist test
(Part 12) : 1981	Part 12 Dust test
(Part 16) : 1983	Part 16 Driving rain test
10437 : 1986	Safety requirements for radio transmitting equipment
10820 (Part 1) : 1984	Methods of measurement for radio equipment used in mobile services : Part 1 General definitions and conditions of measurement

3 TERMINOLOGY

For the purpose of this standard, the terms and definitions given in IS 10820 (Part 1) : 1984 shall apply.

4 CONSTRUCTION AND WORKMANSHIP

4.1 The equipment shall be rugged in construction, capable of giving satisfactory performance under uncontrolled environmental conditions in plain/hilly terrains and on off-shore drilling platforms.

4.2 The final power stage shall be protected from short/open circuited antenna terminals.

4.3 Suitable reflectometer should be made available as option for indication forward/reflected power to help in tuning the transmitter.

4.4 All the operational control and indicators shall preferably be on the front panel. Automatic protection/interlocking devices to avoid damages to the equipment in case of excessive loads/faulty operating conditions, shall be provided. The equipment shall have the reverse polarity protection in case it is used with batteries.

5 SAFETY REQUIREMENTS

5.1 The safety requirements for transmitting equipment shall be in accordance with IS 10437 : 1986.

5.2 For receiving equipment the safety requirements are under consideration.

6 GENERAL REQUIREMENTS

a) Frequency range	2 to 30 MHz
b) Duty condition	Continuous telecommunication
c) Class of emission	The transreceiver shall be capable of functioning on one or more of the following modes: A1A, J3E, R3E, MCW & FSK
d) VSWR	1·5 *Max*
e) Frequency stability	Maximum 50 Hz deviation from the specified value over the entire operating temperature range
f) Adjacent channel spacing	4·5 kHz
g) rf input/output impedance	i) 50 ohms unbalanced ii) 600 ohms balanced with antenna tuning unit (optional)
h) Antenna radiation in receive mode	Less than 10 μV
j) Temperature range	Operating 0 to +55 degree C Storage − 10 to +55 degree C (optional)
k) Power supply	
i) ac mains	240 V+10 percent, 50 Hz+4 percent In addition, optional operation at 115 V/60 V shall also be provided
ii) dc supply	Nominal 12 V/24 V
m) Life expectancy	Major assemblies — 10 yrs Expected time between two major overhauls — 5 yrs
n) Types of operation	Simplex — Press to talk — Semi-Duplex-Voice operated carrier Duplex Switching (Optional)
p) Types of antenna	Dipole antenna system Slant wire antenna (with antenna matching unit) Whip antenna (with antenna matching unit)
q) Frequency step size (for synthesized types only)	100 Hz
r) Over audio frequency response (300 Hz to 3·0 KHz)	Within +2 /—4 dB in the entire frequency range

7 PERFORMANCE REQUIREMENTS OF TRANSMITTING EQUIPMENT

a) Frequency error	+ 1 ppm over the entire operating temperature range
b) Terminal radio trequency power	
i) Peak envelope power	20 W, 50 W, 100 W, 125 W. The output power shall be within ±3 dB of the nominal output under normal conditions over the entire temperature range and under supply voltage/frequency fluctuations and other adverse conditions. NOTE — For 20 W transmitting equipment, the power shall be reduceable in steps to lower level for specific uses.
ii) Ratio of carrier power to the rated RF output power (carrier suppression)	i) For suppressed carrier — More than 40 dB ii) For reduced carrier — More than 6 dB
iii) Spurious emissions	Less than 40 dB

c) Overall efficiency	35 percent *Minimum*
d) Modulation characteristics	Within 3 dB over entire input frequency range
e) Undesired side band suppression	At least 40 dB at 4·5 KHz
f) Audio frequency harmonic distortion factor	Less than 4 percent
g) Relative intermodulation product level with respect to peak envelope power	Better than 30 dB
h) Hum and noise	Better than 40 dB
j) Audio bandwidth (– 6 dB)	300 Hz to 3 kHz

8 PERFORMANCE REQUIREMENTS OF RECEIVING EQUIPMENT

a) Rated audio frequency power output	At least 1 W at $\leq$ 5 percent distortion
b) Receiver sensitivity	0·5 μV for $\frac{S+N+D}{N+D}$ ratio of 12 dB where S = Wanted audio frequency signal due to standard test modulation N = Noise with standard test modulation D = Distortion with standard test modulation
c) Audio frequency response	Within $\pm$2dB in the entire frequency range
d) Relative audio frequency intermodulation product level	Better than 60 dB
e) Image rejection	Better than 70 dB
f) Selectivity	300 Hz to 3·4 kHz (for 6 dB)
g) Maximum signal input	12 V
h) Cross modulation	Better than 60 dB
j) Spurious response immunity	Better than 60 dB
k) Intermodulation immunity	Better than 60 dB
m) Automatic gain control (AGC) characteristics	The audio frequency output shall not change by more than 6 dB for RF antenna input change of 60 dB
n) Dynamic AGC characteristics	
i) For voice communication	
1) AGC attack time	10 ms
2) AGC recovery time	1 s
ii) For telegraphy	Under consideration
p) Overload protection	Receiver protected for input 30 V rms

9 TELEGRAPHY

a) A1 keying	
i) High speed	Up to 100 bauds
ii) Low speed	Up to 25 bauds
b) Frequency shift keying	
i) Frequency shift	±400 Hz (Fixed)
ii) Keying speed	50 bauds (Nominal)

10 TELEPHONY

a) Audio frequency range	300 Hz to 3 kHz
b) Audio compression range	Output variation $\leqslant$ 4 dB for input variations of 30 dB
c) Microphone input	2 to 60 mV into 300 ohms (Nominal level; 6 mV)
d) Line input	200 mV to 6 V into 600 ohms balanced (Nominal level: 0 dBm)

11 ENVIRONMENTAL TESTS

Tests	*Severity*	*In Accordance with*
a) Cold test	– 10°C for 16 h	IS 9000 (Part 2/Sec 4) : 1977
b) Dry heat	+ 55°C for 16 h	IS 9000 (Part 3/Sec 5) : 1977
c) Damp heat	– 40°C, 95 percent RH for 10 days	IS 9000 (Part 4) : 1979
d) Vibration	— 10 — 500 Hz, 2 h/axis	IS 9000 (Part 8) : 1981
e) Shock	1 km/s^2	IS 9000 (Part 7/Sec 1) :1979
f) Bump	400 bumps, 400 m/s^2	IS 9000 (Part 7/Sec 2) : 1979
g) Free fall	250/500 mm	IS 9000 (Part 7/Sec 4) : 1979
h) Dust test		IS 9000 (Part 12) : 1981
j) Salt mist		IS 9000 (Part 11) : 1983
k) Driving rain test		IS 9000 (Part 16) : 1983

11.1 After environmental tests, the performance tests are to be carried out and there shall not be any deviation in the performance results from the results obtained before the environmental tests.

12 MARKING

12.1 The following information shall be clearly and legibly marked on the transreceiver:

a) RF output power,

b) Maximum power consumption,

c) Type or Model No. and Sl No.,

d) Manufacture's name and trade mark,

e) Date of manufacture (may be in coded form as per IS 8186 : 1976),

f) Country of manufacture,

g) Rated input voltage,

h) Frequency of operation, and

j) Date of expiry of warranty period.

12.2 The transreceivers may also be marked with the Standard Mark.

13 TEST SCHEDULE

13.1 Type Tests

All the tests specified in this standard shall constitute the type tests.

13.2 Acceptance Tests

a) Overall efficiency b) Effective radiated power c) Carrier suppression	For transmitting equipment
d) AGC characteristics	For receiving equipment

13.3 Routine Tests

a) Visual examination	
b) Sensitivity c) Selectivity d) Audio frequency response	For receiving equipment
e) Distortion	For transmitting equipment

14 OPERATING AND INSTRUCTION MANUAL

14.1 The manufacturer shall, on request, supply the following technical literature:

a) Operation and maintenance manuals and schedules,

b) Trouble shooting charts,

c) Assembly drawings,

d) Repair manual,

e) Share parts catalogue,

f) Any special test equipment and special maintenance for repair/servicing shall be mentioned, and

g) User handbook (important test result card).

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